

Hydrogen water, endurance and perceived fatigue

A clear summary of a 2019 randomised, double-blind, placebo-controlled study

The short answer: Small, statistically significant changes were reported. Drinking 500 mL of hydrogen-rich water shortly before cycling was associated with lower self-rated fatigue. In trained participants, estimated VO₂ max also improved slightly. The practical importance of these changes remains uncertain.

How was the study organised?

Experiment 1: 99 people Healthy, untrained adults aged 40-70; mild cycling	Experiment 2: 60 people Fitness-club members aged 20-69; moderate cycling
Hydrogen water 500 mL at 0.8 mg/L, taken 30 minutes before exercise	Hydrogen water 500 mL at 1.0 mg/L, taken 10 minutes before exercise

In each experiment, everyone first completed a session after drinking placebo water. At the later session, participants received either hydrogen water or placebo. The packages looked identical. Researchers compared the change between sessions.

What did the study find?

Outcome	Reported result	Plain-English meaning
Perceived fatigue - mild exercise	Visual Analogue Scale fatigue scores improved more in the hydrogen group ($P=0.046$). The effect was most apparent in participants reporting greater initial fatigue.	After mild cycling, the hydrogen group reported a small reduction in how fatigued they felt.
Estimated VO₂ max - mild exercise	No significant hydrogen-placebo difference was found.	Hydrogen water did not improve the estimated endurance measure in Experiment 1.
Estimated VO₂ max - moderate exercise	The hydrogen group showed a statistically significant improvement ($P=0.015$; relative change $P=0.019$).	The bike test estimated a small improvement in aerobic capacity in trained participants.
Perceived exertion - moderate exercise	Borg scale ratings improved significantly with hydrogen water ($P=0.00078$).	Trained participants rated the exercise as slightly less demanding.

Promising signals - modest and debated

Why the findings matter

The study included 159 adults across two experiments and used blinded placebo water. It suggests that timing, training status and exercise intensity may influence the response to hydrogen-rich water.

The results support further research into whether hydrogen water can influence perceived effort or short-term exercise measurements.

What was actually measured

Fatigue and exertion were self-rated using VAS and Borg scales. VO2 max was estimated automatically from a submaximal cycle test and heart rate; it was not directly measured during a maximal laboratory oxygen-consumption test.

Important limitations

- Every participant received placebo first, so the session order was not fully counterbalanced.
- The two experiments differed in population, exercise intensity, hydrogen concentration and timing.
- The changes were statistically significant but small; a published critique questioned their clinical relevance.
- Subjective ratings can be influenced by expectations and test familiarity.
- No physiological mechanism was measured.
- Part of Experiment 1 was funded by a five-company hydrogen-water consortium; water was supplied by companies.
- Two authors disclosed a hydrogen-related patent or consultancy.

Best interpretation

A single 500 mL serving of hydrogen-rich water before cycling produced small improvements in some self-rated fatigue measures and estimated VO2 max. The results are interesting, but they do not establish a meaningful improvement in athletic performance or everyday endurance.

Quick glossary

VAS	Visual Analogue Scale: a line on which participants rate how fatigued they feel
Borg scale	A 6-20 scale used to rate perceived effort during exercise
VO2 max	The maximum rate at which the body can use oxygen; here it was estimated from a submaximal test
Statistical significance	Evidence that a difference is unlikely to be due to chance alone; it does not show that the difference is large or useful

Original study Mikami T, Tano K, Lee H, et al. Drinking hydrogen water enhances endurance and relieves psychometric fatigue: a randomized, double-blind, placebo-controlled study. Canadian Journal of Physiology and Pharmacology. 2019;97(9):857-862. [Read the original study record](#) | DOI: [10.1139/cjpp-2019-0059](#)

Educational summary only. Molecular hydrogen is still being researched and should not be presented as a treatment, cure or substitute for medical care. This summary explains the study's findings and does not constitute medical advice.